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## The Phase 2 NRA

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### ABSTRACT

We present points of special interest to potential proposers for the Compton Observatory Phase 2 Guest Investigator Program. A general summary of some of the most important details of the Phase 2 NRA is followed by an enumeration of the modes of participation and proposal types available to GI proposers. Finally, the method which is planned for selection of the Phase 2 Guest Investigations in parallel with the development of a preliminary Phase 2 observing timeline is outlined. The ways in which the selection of targets by GIs could be affected by the Phase 2 timeline development procedure is described.

#### 1. Overview of the Phase 2 NRA

The NASA Research Announcement (NRA) for the Gamma Ray Observatory (now Compton Gamma Ray Observatory [CGRO]) Phase 2 Guest Investigator Program has now been released. Some key dates for this NRA are:

NRA Release	September 16, 1991
Proposals Due	December 20, 1991
Selections Announced	April 1992
Start of Observing Period	August 20, 1992
End of Observing Period	August 20, 1993

Note that an addendum to the NRA was issued soon after the original NRA release on September 16. This addendum calls particular attention to the opportunity to propose theoretical and correlative investigations aimed at understanding the early Compton Observatory observations as well as anticipated later Compton observations.

In order to submit a proposal in response to the NRA, it is essential to have not only the NRA itself and the Appendices therein, but also appendices F (Science Plan), G (The Gamma Ray Observatory as a Guest Investigator Facility) and H (Project Data Management Plan). These appendices contain details of data products, science capabilities of the instruments, and in-flight performance of the instruments which would be used in developing a Guest Investigator proposal.

The Phase 2 NRA, unlike the earlier Phase 1 NRA, permits Guest Investigators to propose their own independent observations of gamma-ray sources. At the same time, all the modes of GI participation previously available are still possible.

## 2. Modes of Participation by Guest Investigators

The Phase 2 NRA enumerates two modes of participation by GIs, and six types of Phase 2 proposals. In this instance, modes of participation refer to the degree of collaboration between GIs and the Instrument Teams, and proposal types refer to the amount of processing and data reduction which has been done to the data before it is given to the Guest Investigator. The primary modes of participation are:

1. A Guest Investigator may propose to work closely with one or more Instrument Scientists, or with an Instrument Specialist who is a member of the Compton Observatory Science Support Center but is co-located with the Instrument Team. This mode of participation is appropriate where the GI's data analysis plans require extensive use of software developed for CGRO data analysis by the Instrument Teams, such as low-level data might call for.
2. An alternative mode is to have a Guest Investigator work independently, with only occasional support for data retrieval or processing activities from the Science Support Center personnel or from Instrument Team members. This is most appropriate where higher-level data products are being analyzed so that the details of the hardware and software performance of the CGRO instruments are not critical to the data analysis.

As extensions of these two modes, a continuum of other degrees of collaboration between GIs and Instrument Team members is possible. Proposers should be careful to indicate in their proposals the degree of support from and collaboration with Instrument Team members or Instrument Specialists that is anticipated.

Proposal types are categorized as follows:

- Type 1: Proposals for analysis or use of existing low-level processed CGRO data; this includes both archival data and new data.
- Type 2: Proposals for analysis or use of existing high-level processed CGRO data; this includes both archival data and new data.
- Type 3: Proposals for guest observing time in which the Investigator plans to work with low-level processed CGRO data.
- Type 4: Proposals for guest observing time in which the Investigator plans to work with high-level processed CGRO data.
- Type 5: Proposals for theoretical or correlative investigations in direct support of the CGRO observing program. Note that there are limitations as to which aspects of correlative observing programs can be supported.
- Type 6: Proposals for new observations from CGRO Instrument Teams. This category is intended to provide for follow-up observations during Phase 2 of sources detected during Phase 1 after the NRA release.

A new subcategory of proposal included within types 1 and 2 is the use of archival data. All CGRO data will be archived and made available to all users approximately 12 months after it is made available to the Instrument Team members for analysis. Hence the start of the archiving of Phase 1 data will occur during Phase 2.

The proposal forms included in the NRA provide for an indication of the proposal type. In general, high-level processed data consists of images, spectra, source locations, or light

curves in physical units with a minimum of remaining instrumental artifacts, suitable for direct analysis or for further processing with a general-purpose data analysis language such as IDL or IRAF. Low-level data may be raw spectra before background subtraction, or photon event lists, etc.

### 3. Target Selection

In proposing Phase 2 Guest Investigations, proposers must be aware of how their choice of proposed targets will affect their chances of being selected. A careful reading of the NRA shows that there are several different classes of targets, each class with its own advantages and disadvantages with respect to GI selection. Of course, the most important single criterion in target selection by a proposer must always be the scientific objectives; other things being equal, each proposal should propose those targets best suited for the planned scientific investigation. The categories of targets could be broken out as follows:

1. Topics or Sources Reserved for the Instrument Teams.....Page C-7 of the NRA lists a set of specific sources (e.g., galactic supernovae) and general areas (e.g., sky surveys) that are reserved for the respective Instrument Teams. Independent or collaborative Guest Investigations in these areas are not solicited by the NRA, except for the OSSE team where Guest Investigators are welcome to propose to participate in the OSSE scientific teams working on these topics. If Guest Investigators are selected to join the OSSE teams on these topics, it is expected that the observing time for each scientific team will be allocated between GI time and Instrument Team time in proportion to the number of Instrument Team members and GIs on the scientific team.
2. High Priority Instrument Team Targets.....Part 1 of Tables 3 and 4 in Appendix D of the NRA lists those targets which the EGRET, COMPTEL and OSSE Teams have designated as their high priority observational objectives for Phase 2. If these targets can be observed within the 70% of observing time allocated to the Instrument Teams, then the Instrument Teams have priority over independent GI investigations of these targets. However, GIs may propose to collaborate with the Instrument Teams in investigations of these targets. All such collaborations should be arranged before the proposal is submitted. In addition, it is quite possible that not all of the targets listed in part 1 of Tables 3 and 4 can be scheduled during the allocated Instrument Team portion of the Phase 2 timeline, or that some targets may be observed, according to an optimized Phase 2 timeline, for longer periods than the Instrument Teams have specified in Tables 3 and 4. In those cases, GI proposals for these targets may be selected by the Peer Review Panel.
3. Low Priority Instrument Team Targets.....Part 2 of Tables 3 and 4 in Appendix D of the NRA lists targets which the Instrument Teams would observe as second priority during Phase 2. These targets would be observed by the Instrument Teams if observing time or opportunities are available, but GIs are free to propose observations of these targets and GIs may be awarded proprietary rights to observations of these targets by the Peer Review Panel.

4. All other targets are open for GI proposals.....It should be noted that the Instrument Teams are permitted to submit proposals of their own for other targets (type 6 proposals), due on December 20, 1991, which would be reviewed in competition with the GI proposals. This was done to allow follow-up observations by the Instrument Teams of interesting sources detected or marginally detected in Phase 1. In anticipation of this, the EGRET/COMPTEL list of high priority sources in Table 3, part 1, leaves a significant fraction of the Phase 2 observing time as pointing TBD (item I). In addition some other special target cases still deserve separate mention. The following sections describe these cases.
5. Burst sources, such as cosmic and solar bursts.....BATSE will make available 30% of randomly selected bursts (excluding the largest burst of each month) and 50% of solar flares to GIs. COMPTEL, EGRET and OSSE will also make available 30% of their burst data. Whenever possible, GIs would receive data from the same burst from multiple instruments. In some cases, different GIs could be given access to overlapping or identical datasets of burst data, if their science objectives allowed for this.
6. BATSE non-burst targets.....Besides the burst sources just described, on page D-12 of the NRA are listed 17 sources whose temporal variability the BATSE Team intends to study during Phase 2, using occultation and periodic variability search techniques. GIs may propose collaborative investigations of these sources with BATSE team members. For sources not listed, GIs may propose either independent or collaborative investigations.
7. Targets of Opportunity.....As stated on page D-13 of the NRA, the Instrument Teams will have priority for observations of nearby supernovae or galactic novae. For all other targets of opportunity Guest Investigators may propose without restrictions. However, it must be noted that only a few Targets of Opportunity can be accommodated during each year of the mission.
8. OSSE and COMPTEL science teams.....In addition to the target types listed above, GIs may propose to join the OSSE science teams working in the areas of a galactic plane survey, a comprehensive sky survey, and solar flares. Also, proposers who are interested in working with the COMPTEL Team on targets listed in Part 1 of Table 3 may contact the COMPTEL PI to see if a collaboration can be arranged.

Given these categories, it can be seen that there are some ways in which a GI-proposed target could have a good chance of being observable in the Phase 2 schedule, strictly based on timeline considerations. For example, targets which are within the fields of view specified in Table 3, Part 1 for EGRET-COMPTEL high priority pointings will very likely be observed, so a GI proposal for such a target would be unlikely to be rejected because of scheduling problems. Such targets would be observed in parallel with the high priority EGRET-COMPTEL targets, and the observation of these GI targets would not count against the 30% of spacecraft pointing time allocated to GIs, although it would of course count against total GI time. The other way in which GI observations can be done "in parallel" is to observe multiple GI targets for different GIs at one pointing where the pointing is not driven by an Instrument Team target, but by one or more GI targets. If a proposer had reason to believe that other GI proposers were planning to propose targets in one particular region of the sky not included within a high priority Instrument Team region, it might be advantageous to propose targets in this region rather than in an isolated part of the sky near few other objects of interest. Finally, it may be useful to list two or three targets which could be observed as alternates to optimize the chances that at least one would be

schedulable, as long as the alternates are of nearly equivalent scientific value for the investigation. Listing too many alternate choices would probably be counter-productive, however, as the scheduling problem becomes very poorly defined at some point.

Other target selection criteria result from the spacecraft constraints on the position of the Sun relative to the Compton Observatory z-axis. An inspection of Table 4, Part 1 of the OSSE high priority targets will show that most of these targets are in or near the galactic plane, and often close to the galactic center. For technical reasons, it turns out that it is difficult to schedule many OSSE targets in the galactic plane and very few outside it, while always observing a primary and a secondary OSSE target for each spacecraft orientation. Thus an attempt to observe as many as possible of the high priority OSSE targets may leave opportunities for additional targets outside of the galactic plane. So given a choice, it could be advantageous to propose GI OSSE targets outside the galactic plane, or far from the galactic center. Of course, many classes of targets are virtually all found either inside or outside of the galactic plane region, so this choice may not often present itself.

A proposer should, of course, also study the observing program as completed so far and as planned for the remainder of Phase 1 of the mission (see Table 1, below). This shows individual OSSE targets, and the locations of EGRET/COMPTEL pointings, each of which has a sizable field of view.

#### 4. Planned Phase 2 Scheduling Method (EGRET,COMPTEL, OSSE)

The strong interaction between the observing constraints of the EGRET/COMPTEL instruments, the primary and secondary OSSE targets, the possibilities for parallel observations of multiple targets by EGRET and COMPTEL, and the spacecraft constraints means that it would be very inefficient to simply select a preset number of target-weeks for Phase 2 GI proposals and then to attempt to schedule these targets, as is done for most other missions with GI programs. Instead, it is planned to do the Guest Investigator selection as a two-stage process. First, the Peer Review Panel will rank all of the GI proposals, then a preliminary schedule timeline will be developed taking into consideration the rankings and the other scheduling constraints. The final selection of Guest Investigations would be announced after the preliminary timeline is complete for the entire year, and would reflect the feasibility of actually observing the targets in the selected proposals. While the preliminary timeline would cover the year, it is quite possible that changes would occur during the course of the year, either to accommodate targets of opportunity, or for changes in target priorities by the Instrument Teams. For this reason NASA may choose to slightly overselect the GI proposals beyond those which can be scheduled on any given timeline, to have a few proposals as alternates.

The development of the preliminary timeline will be done using software tools currently available to compute the observing constraints for any combination of spacecraft attitude, primary and secondary OSSE target, and observing week of the year. The timeline will be assembled usually in two-week segments (occasionally one-week observations will be done), at each step scheduling the highest priority candidates currently available, from the following list of targets, in roughly descending order of priority:

- High priority EGRET/COMPTEL and OSSE Instrument Team targets from part 1 of Tables 3 and 4 in the NRA.
- Highly rated Guest Investigator proposal targets.
- Instrument Team supplementary targets (submitted on December 20 and in part 2 of

Table 1

## GRO PHASE 1 VIEWING PLAN AS OF OCTOBER 7, 1991

VIEW PER.	START	+Z-AXIS*		GRO Z-AXIS*			GRO X-AXIS*			OSSE PRIMARY TARGET			OSSE SECONDARY TARGET		
		TARGET	RA	DEC	LONG	LAT	RA	DEC	TARGET	RA	DEC	TARGET	RA	DEC	
1	5/16/91	CRAB PULSAR	88.07	17.14	190.92	-4.74	339.12	46.48	CRAB PULSAR	83.52	22.02	PSR 1957+20	299.84	20.81	
2	5/30/91	CYG X-1	301.39	36.58	73.28	2.56	60.31	33.09	CYG X-1	299.59	35.21	SUN	-	-	
2.1	6/8/91	SUN	87.83	12.47	194.86	-7.29	338.68	56.03	SUN	-	-	CYG X-1	299.59	35.21	
3	6/15/91	SN 1991T	191.54	2.62	299.76	65.46	101.49	1.04	SN 1991T	188.54	2.66	QSO 0736+016	114.82	1.62	
4	6/28/91	NGC 4151	179.84	41.52	156.19	72.08	57.38	31.23	NGC 4151	182.63	39.41	3C 111	64.59	38.02	
5	7/12/91	G CENTER	270.39	-30.96	0.00	-4.00	196.56	24.91	G CENTER	266.40	-28.94	MRK 421	166.11	38.21	
6	7/26/91	SN 1987A	91.28	-67.97	278.00	-29.32	153.97	10.52	SN 1987A	83.86	-69.27	MRK 421	166.11	38.21	
7.1	8/8/91	CYG X-3	310.05	28.06	70.44	-8.31	143.74	61.25	CYG X-3	308.10	40.96	M 82	148.96	69.67	
7.2	8/15/91	GAL 025-14	291.98	-13.27	25.00	-14.00	208.11	24.38	G PLANE 25	279.22	-7.05	NGC 5548	214.50	25.13	
8	8/22/91	VELA PULSAR	124.96	-46.35	262.94	-5.67	198.99	14.71	VELA PULSAR	128.92	-45.18	SN 1991T	188.54	2.66	
9.1	9/5/91	GAL 339-84	8.34	-32.31	338.94	-83.50	244.20	-41.58	GX 339-4	255.71	-48.79	NGC 253	11.89	-25.29	
9.2	9/12/91	HER X-1	251.28	36.89	59.67	40.28	142.05	23.69	HER X-1	254.46	35.34	MRK 421	166.11	38.21	
10	9/19/91	FAIRALL 9	30.91	-60.66	287.85	-54.31	190.28	-27.75	NOVA MUSCAE	171.61	-68.68	3C 279	194.05	-5.79	
11	10/3/91	3C 273	189.02	1.06	294.25	63.67	278.42	-29.71	3C 273	187.28	2.05	G CENTER	266.40	-28.94	
12	10/17/91	CEN A	202.29	-40.09	310.71	22.21	221.48	48.29	CEN A	201.38	-43.01	3C 390.3	280.56	79.76	
13.1	10/31/91	GAL 025-14	291.98	-13.27	25.00	-14.00	208.11	24.38	G PLANE 25	279.22	-7.05	NGC 5548	214.50	25.13	
13.2	11/7/91	GAL 339-84	8.34	-32.31	338.94	-83.50	244.20	-41.58	GX 339-4	255.71	-48.79	ESO 141-55	290.31	-58.67	
14	11/14/91	ETA CAR	156.83	-58.51	285.04	-0.74	274.30	-15.78	G CENTER	266.40	-28.94	ETA CAR	161.95	-59.98	
15	11/27/91	NGC 1275	52.00	40.24	152.63	-13.44	293.36	29.53	NGC 1275	49.96	41.51	CYG X-1	299.59	35.21	
16	12/12/91	SCO X-1	248.36	-17.20	0.00	20.29	351.62	-36.55	G CENTER	266.40	-28.94	SCO X-1	244.97	-15.63	
17	12/27/91	SN 1987A	83.48	-72.27	283.21	-31.62	266.22	-17.72	SN 1987A	83.86	-69.27	G CENTER	266.40	-28.94	
18	1/10/92	M 82	154.59	72.04	137.47	40.48	292.51	13.52	M 82	148.96	69.67	PSR 1929+10	293.05	10.99	
19	1/23/92	GAL 058-43	331.41	-1.93	58.15	-43.00	242.82	36.31	G PLANE 58.1	294.98	22.28	-	-	-	
20	2/6/92	SS 433	285.28	6.37	39.70	0.76	12.01	-27.04	SS 433	287.95	4.99	-	-	-	
21	2/20/92	NGC 1068	39.09	-1.24	171.52	-53.90	308.14	-37.66	G CENTER	266.40	-28.94	NGC 1068	40.67	-0.01	
22	3/5/92	MRK 279	209.76	71.24	115.35	44.88	13.43	18.05	MRK 279	208.24	69.31	M 31	10.69	41.27	
23	3/19/92	CIR X-1	227.43	-54.62	322.14	3.01	11.72	-29.97	CIR X-1	230.23	-57.18	-	-	-	
24	4/2/92	MRK 335	1.59	20.21	108.77	-41.42	76.46	-35.33	MRK 335	1.59	20.21	VELA X-1	135.53	-40.56	
25	4/16/92	GAL 009+57	223.34	11.03	9.53	57.15	358.02	74.51	4U 0115+634	19.86	62.49	-	-	-	
26	4/30/92	MCG +8-11-11	84.37	46.61	164.06	7.90	353.16	1.14	MCG +8-11-11	88.73	46.44	III Zw 2	2.63	10.97	
27	5/14/92	GAL 224-40	68.97	-25.09	224.00	-40.00	53.03	64.04	3C 390.3	280.56	79.76	SN 1987A	83.86	-69.27	
28	5/28/92	CAS A	345.77	57.49	108.75	-2.37	100.24	14.79	CAS A	350.87	58.81	GEMINGA	98.48	17.77	
29	6/11/92	NGC 2992	149.50	-14.73	252.41	30.65	61.41	7.23	NGC 2992	146.43	-14.33	3C 120	68.29	5.35	
30	6/25/92	ESO 141-55	287.12	-61.21	335.10	-25.56	144.33	-23.64	ESO 141-55	290.31	-58.67	MCG -5-23-16	146.92	-30.96	
31	7/9/92	GAL 225+02	110.40	-10.22	225.46	1.95	197.74	14.42	M 87	187.71	12.39	-	-	-	
32	7/23/92	PKS 2155-304	330.74	-33.09	13.11	-53.32	121.56	-53.26	PKS 2155-304	329.72	-30.22	SMC X-1	19.18	-73.44	
33	8/6/92	MCG +5-23-16	142.06	30.03	196.66	45.66	186.75	-50.89	MCG +5-23-16	143.56	27.33	NGC 3783	174.76	-37.74	

\* Z-axis is pointing direction for COMPTEL and EGRET. OSSE points in X-Z plane. RA and DEC are J2000.

Tables 3 and 4) that were highly rated by the peer review in competition with GI proposals to observe the same objects.

- Guest Investigator targets from lower-rated GI proposals.
- Instrument Team low-priority targets (from Tables 3 and 4, part 2) not proposed in any GI proposals.
- Other Instrument Team targets

As the timeline is developed, the overall 70%-30% division of Instrument Team time versus GI time will be kept in mind so that the final timeline will reflect this split as accurately as possible.

The scheduling of BATSE observations is not affected by this timeline procedure. For BATSE, the limit on the number of GI proposals selected will be based on the rankings of the proposals, the general 70%-30% split of data between the Instrument Team and GIs, the limit on the number of special-format observations (e.g. pulsars) which can be done per week, and the funding limitations of the Guest Investigator program.